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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/869,386	06/27/2001	Chao-Shih Joseph Huang	PHN17.717	4234

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EXAMINER

VO, HUYEN X

ART UNIT PAPER NUMBER

2655

DATE MAILED: 06/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/869,386

Applicant(s)

HUANG, CHAO-SHIH JOSEPH

Examiner

Huyen Vo

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 January 2005.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-10 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-5 and 7-10 is/are rejected.  
7) ☒ Claim(s) 6 is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 27 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Response to Arguments*

1. Applicant has submitted an amendment filed 1/4/2005, arguing to traverse the art rejection based on limitations regarding "obtaining a correlation coefficient  $Y_{sn}$  indicative of a correlation in the spectral domain between a clean speech signal component  $s$  and a noise signal component  $n$  present in the input signal  $y$  ( $y = s + n$ )" and "estimating magnitudes of respective noise-suppressed spectral components  $S^{\wedge}(k)$  by solving a correlation equation giving a relationship between the magnitudes of the respective spectral components  $|Y(k)|$  of the noisy input signal  $y$ , the spectral components  $|Y(k)|$  of the clean speech signal  $s$ , and the spectral components  $|N(k)|$  of the noise signal  $n$ , where the equation includes the correlation based on the obtained correlation coefficient  $y_{sn}$ " (amendment pages 6-7). Applicant's arguments have been fully considered but they are not persuasive. The examiner erroneously cited equation 4 on page 1590 for the teaching of obtaining correlation coefficient. However, applicant is required to review prior art of record thoroughly. The prior art of record, Lim et al., does in fact anticipate the two limitations mentioned above. The step of obtaining correlation coefficient between clean speech signal and noise signal and the step of estimating magnitudes of respective noise-suppressed spectral components  $S^{\wedge}(k)$  by solving a correlation equation giving a relationship between the magnitudes of the respective spectral components  $|Y(k)|$  of the noisy input signal  $y$ , the spectral components  $|Y(k)|$  of the clean speech signal  $s$ , and the spectral components  $|N(k)|$  of the noise signal  $n$ , where the equation includes the correlation based on the obtained

correlation coefficient are described on *page 1591, specifically equations 9-12*. Thus, previous ground of rejection is maintained.

***Allowable Subject Matter***

2. Claim 6 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

3. The following is an examiner's statement of reasons for allowance of subject matters in claim 6: *Lim et al. (IEEE Publication)*, disclose a method for enhancing noisy speech by subtracting the spectral of the noisy speech to the spectral of the estimated noise to obtain a clean speech signal (*see Lim et al. enclosed*). However, Lim et al. fail to disclose the step of: initializing the correlation coefficient  $Y_{sn}$  with a non-zero value; and iteratively: performing the step of solving the correlation equation to obtain  $|S^{(k)}|$ ; and estimating a new correlation coefficient based on a gradient decent of the negative spectrum ratio NSR for  $S^{(k)}$ . Furthermore, it would have not been obvious to one of ordinary skill in the art at the time of invention to modify Lim et al. by incorporating the teaching of the step above. Therefore, subject matters in claim 6 is allowable over prior art of record.

***Claim Rejections - 35 USC § 102***

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4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless – (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-2, 7-10 are rejected under 35 U.S.C. 102(b) as being anticipated by Lim et al. (IEEE Publication).

6. Regarding claims 1 and 10, Lim et al. disclose a method and apparatus for reducing noise in a noisy time-varying input signal  $y$ , such as a speech signal, the method including:

receiving the noisy time-varying input signal  $y$  (*figure 3*);

deriving from the input signal  $y$  a plurality of spectral component signals representing respective magnitudes  $|Y(k)|$  of spectral components of the input signal  $y$  (*FFT represented by  $F$  in figure 3*);

obtaining a correlation coefficient  $Y_{sn}$  indicative of a correlation in the spectral domain between a clean speech signal component  $s$  and a noise signal component  $n$  present in the input signal  $y$  ( $y = s + n$ ) (*Equation 4 on page 1590, the last two terms on the right hand side are correlation terms*); and

estimating magnitudes of respective noise-suppressed spectral components  $S^{\wedge}(k)$  by solving a correlation equation giving a relationship between the magnitudes of the respective spectral components  $|Y(k)|$  of the noisy input signal  $y$ , the spectral components  $|Y(k)|$  of the clean speech signal  $s$ , and the spectral components  $|N(k)|$  of

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the noise signal  $n$ , where the equation includes the correlation based on the obtained correlation coefficient  $y_{sn}$  (*page 1590-1591, note the correlation terms*).

7. Regarding claim 2, Lim et al. further disclose a method as claimed in claim 1, wherein the correlation coefficient  $Y_{sn}$  is predetermined (*page 1590, second column, by setting it equal to zero*).

8. Regarding claim 7, Lim et al. further disclose the method as claimed in claim 1, wherein the step of solving the correlation equation includes iteratively estimating the noise-suppressed spectrum  $S^{\wedge}(k)$  (*page 1593, particularly bottom of column 1 and top or column 2*).

9. Regarding claim 8, Lim et al. further disclose that the method includes calculating an initial estimate of a magnitude of the noise-suppressed spectrum  $S^{\wedge 0}(k)$  by subtracting a magnitude of an estimate of the respective spectral components  $N^{\wedge}(k)$  of the noise signal  $n$  from a magnitude of the respective spectral components  $Y(k)$  of the noisy input signal  $y$  (*page 1593, particularly bottom of column 1 and top or column 2*).

10. Regarding claim 9, Lim et al. disclose the method as claimed in claim 7, wherein the step of performing the iterative spectrum estimation include in each iteration: estimating a magnitude of an auxiliary noise-suppressed spectrum based on the correlation equation where a term with the correlation coefficient  $y_{sn}$  is based on a

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current estimate of a magnitude of the noise-suppressed spectrum  $S^{(l+1)}(k)$  (page 1593, particularly bottom of column 1 and top of column 2); and estimating a new magnitude of the noise-suppressed spectrum  $S^{(l+1)}(k)$  based on the estimated magnitude of the auxiliary noise-suppressed spectrum and on the current estimate of a magnitude of the noise-suppressed spectrum  $S^{(l)}(k)$  (page 1593, particularly bottom of column 1 and top of column 2).

### **Claim Rejections - 35 USC § 103**

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lim et al. (IEEE Publication) in view of Wang et al. (US Patent No. 4697261).

13. Regarding claim 3, Lim et al. do not disclose a method as claimed in claim 1, wherein the step of obtaining the correlation coefficient  $Y_{sn}$  includes estimating the correlation coefficient  $Y_{sn}$ . However, Wang et al. teach the step of obtaining the correlation coefficient  $Y_{sn}$  includes estimating the correlation coefficient  $Y_{sn}$  (col. 4, ln. 25-67).

Since Lim et al. and Wang et al. are analogous art because they are from the same field of endeavors, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Lim et al. by incorporating the teaching of Wang et al. in order to better estimate speech and noise signals to enhance the noise-suppression process.

14. Regarding claims 4-5, Lim et al. further disclose that the step of estimating the correlation coefficient  $Y_{sn}$  includes determining a minimum negative spectrum ratio (*page 1590, particularly at the bottom of column 2*), and the negative spectrum ratio NSR represents a proportion of spectral components  $S^k$  which would be negative based on the solution of the correlation equation (*page 1590, particularly at the bottom of column 2*).

### **Conclusion**

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of



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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Huyen Vo whose telephone number is 703-305-8665.

The examiner can normally be reached on M-F, 9-5:30.

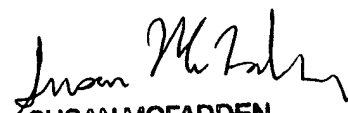
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doris To can be reached on 703-305-4827. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

HXV

5/18/2005

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SUSAN MCFADDEN  
PRIMARY EXAMINER